APPENDICES

APPENDIX A

PRELIMINARY THREE OAKS MINE DEPARTMENT OF ARMY PERMIT APPLICATION SECTION 404 (B)(1) GUIDELINE ANALYSIS

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1.0 INTRODUCTION AND PURPOSE OF THE PROJECT

Alcoa Inc. (Alcoa) has proposed the development of the Three Oaks Mine, a lignite mine in Bastrop and Lee Counties, Texas. The purpose of the proposed Three Oaks Mine is to provide a long-term, economically stable fuel supply for the existing Rockdale power generating station sufficient to ensure continued operation of Alcoa's Rockdale aluminum smelter. This need is currently being met by lignite reserves mined at the existing Sandow Mine. Alcoa estimates that within 5 years, the Sandow Mine pits will have advanced to depths where additional long-term production is too costly (based largely on overburden depths to be excavated and volume of groundwater to be handled) to sustain the generating station. As a result, Alcoa must secure a new, economically viable fuel source to keep the power generating station operating or an economically viable alternative energy source for the smelter operations. The proposed mining activities at the Three Oaks Mine would replace mining at the Sandow Mine to provide a long-term supply of lignite to the Rockdale power generating station.

The Rockdale power generating station consists of three 120-megawatt (MW) units owned by Alcoa and one 595-MW unit owned by Texas Utilities (TXU), which provide power for Alcoa's existing Rockdale aluminum smelter as well as providing power to the TXU electrical grid system. Under Alcoa's current contractual agreement with TXU (extending through year end 2013), Alcoa supplies 4 million tons per year of lignite or the equivalent in western coal for the TXU generating unit at Rockdale. In the absence of a local lignite source, Alcoa would be obligated to install the required facilities to deliver western coal to this unit. If Alcoa did not provide the required coal, Alcoa would be in default on the Alcoa-TXU contract. Alcoa would have to provide the revenue (estimated at $14 million per year) in lieu of providing the fuel source for TXU's allocated 95 MW of power production per year for the remainder of the contract. Alcoa also would be responsible for the balance of the cost of capital (estimated at $12 million per year) on the TXU unit through the remainder of the contract (Hodges 2001). Based on the anticipated end of the economic life of the Sandow Mine (approximately 2004), failure to develop an alternate local lignite source would likely require major capital expenditures for fuel conversion of the generating units at Rockdale in order for these units to continue producing electricity; see Section 2.4 of the environmental impact statement (EIS) for additional information on alternative fuel sources.

Alcoa's Rockdale aluminum smelter is a very large power consumer with an average usage of approximately 500 MW and a maximum demand of up to 700 MW. Due to the high energy requirements of primary aluminum production, power costs constitute one of the largest single factors affecting the cost of the raw aluminum product. Evans (1995) estimates that about one-third of the total cost of primary aluminum production is for the energy required in the process. As a result, aluminum smelters are typically located close to sources of low-cost electrical power. Alcoa's smelter, currently the largest active aluminum smelter in the country, was sited at Rockdale in the early 1950s due to the local abundance of a low-cost fuel source (lignite) at the Sandow Mine, which has provided a stable economical power supply. In order to continue producing aluminum at a cost that is competitive in the world market, Alcoa must secure a new economical fuel source to maintain its production of low-cost electrical power. Based on the current costs of producing lignite at the Sandow Mine, Alcoa projects that it needs to have an economically viable alternate fuel source developed and available to feed the power generating facilities by 2003 or terminate operations at the Rockdale aluminum smelter (Hodges 2001).

1.1 Location

The proposed Three Oaks Mine would be located in the Brazos River and Colorado River drainage basins in Lee and Bastrop Counties, Texas, directly southwest of the existing Alcoa Sandow Mine, located near Rockdale, in Milam and Lee Counties, Texas. The proposed project would be located approximately at universal transverse mercator (UTM) coordinates 666063.160 East and 3359551.170 North 14 on the Beaukiss, Elgin East, McDade, and Structure, Texas, 7.5-minute U.S. Geological Survey (USGS) quadrangle maps in the USGS Hydrologic Unit 12090301.

1.2 Project Description

The proposed Three Oaks Mine permit area would consist of approximately 16,062 acres of land, of which 5,661 acres would be mined with a total surface disturbance of approximately 8,654 acres over the projected 25-year life of the mine. An average of approximately 7 million tons of lignite would be mined annually and consumed for electric power generation at the Rockdale power generating station.

Activities associated with this project would include construction of attendant features associated with the mine, in addition to activities associated with the mining of lignite and operation of the mining facility. Prior to the commencement of mining, haul roads, sedimentation ponds, surface water diversions, power lines, maintenance facilities, offices, and warehouses would be constructed. Additional work in preparation for mining would include installation of dewatering and depressurization wells. Installation of dewatering wells prior to the initiation of mining is necessary to remove water from the general mining area. Additionally, the installation of depressurization wells that would reach into the Simsboro Formation would serve to reduce artesian pressure on the floor of the mine pits. Water pumped from these wells would be directed to sedimentation ponds, discharged directly into nearby streams, or piped and routed to a public water supply system. Alcoa has contracted with the San Antonio Water System (SAWS) to potentially furnish mine depressurization water to the City of San Antonio. SAWS has not yet decided if they will accept this water, and several other public water systems have expressed interest in receiving this water. Consequently, a final determination on the ultimate recipient of this water has not yet been made. In the event that the mine water is not accepted by a water supply system, it would be discharged into Middle Yegua Creek located within the Brazos River drainage basin, and Big Sandy Creek located in the Colorado River drainage basin. The planned dewatering and depressurization system is discussed in greater detail in Section 2.5.1.2 of the EIS.

The mining process would involve the removal of up to 300 feet of sand and clay overburden to expose the 4 to 5 feet thick seams of lignite that are relatively continuous within the lower portion of the Calvert Bluff Formation. Overburden would be removed using electric draglines and the exposed lignite would be extracted using backhoes and front-end loaders. This material would be transferred to haul trucks and taken to a central blending facility where the lignite would be transferred to a conveyor or placed into other trucks for transport to the Rockdale power generating station. Following removal of lignite from the floor of the initial mine pit, the dragline would reverse direction and continue removing overburden on the downdip (southeast) side of the pit and placing it back into the previously mined pit. Thus, with each pass of the dragline, a new pit would be created alongside the earlier pit from which the lignite had been removed and which was now being refilled. In essence, the operating pit would gradually “move” in a southeasterly

direction, exposing additional lignite with each pass of the mining operation. This same process would continue throughout the life of the mine. Recontouring and revegetation activities would follow at a safe distance behind the dragline operations. An average of approximately 640 acres of land would be in varying states of mine disturbance at any given time. This includes facilities and transportation areas that would exist throughout the life of the operation as well as areas undergoing various mining activities which have not yet been revegetated.

The proposed Three Oaks Mine would result in the discharge of approximately 215,442 cubic yards of dredged and fill material into approximately 67.4 acres of waters of the United States (U.S.) over a period of 25 years. This total includes approximately 19.9 acres of ephemeral streams, 3.7 acres of intermittent streams, 38.5 acres of on-channel ponds, and 5.3 acres of non-forested wetlands.

1.3 Regulatory Authority

This document fulfills the requirements of Section 404(b)(1) of the Clean Water Act (CWA). The purpose of this analysis is to identify and evaluate practicable alternatives as defined in 33 Code of Federal Regulations (CFR) 230.3 that minimize the impacts to the aquatic resource. The Section 404(b)(1) guidelines are the substantive criteria with which discharges must comply before a Section 404 permit may be issued by the U.S. Army Corps of Engineers (USACE). These guidelines have been developed by the U.S. Environmental Protection Agency (USEPA) in coordination with the USACE.

The fundamental precept of the guidelines is that discharges of dredged or fill material into waters of the U.S., including wetlands, should not occur unless it can be demonstrated that such discharges, either individually or cumulatively, will not result in unacceptable adverse effects on the aquatic ecosystem. Discharge of dredged or fill material from the proposed project must comply with restrictions set forth in the guidelines. These restrictions include the following:

1. No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.

2. Discharge is not permitted if it causes or contributes to violation of applicable state water quality standards; violates toxic effluent standards; jeopardizes the continued existence of species listed under the Endangered Species Act of 1973; adversely affects designated critical habitat; or adversely affects any designated marine sanctuary under the Marine Protection, Research, and Sanctuaries Act of 1972.

3. Discharge is not permitted which would cause or contribute to significant degradation of the waters of the United States, including significant adverse effects on aquatic organisms and ecosystems.

4. No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.

These restrictions provide the general basis for the subsequent sections of the Section 404 (b)(1) analysis.

1.4 Practicability

Pursuant to Section 404(b)(1) of the CWA, the USACE defines practicable alternatives as those that are "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes" (ibid.) Alcoa has provided industry-specific information with regard to cost, existing technology, and logistics on which to base practicability criteria for the proposed project. The USACE has verified that information and developed practicability criteria against which the preferred project and the identified alternatives can be compared.

1.4.1 Cost

Aluminum is traded as a commodity on the world market, and its price reflects global conditions. To satisfy project objectives, the alternative must enable Alcoa's Rockdale smelter to remain in operation and produce aluminum at a cost that is competitive in the world market. Because smelting requires large amounts of electricity, the cost of electricity is important to the viability of aluminum production, and the chosen alternative must provide an economical power supply. Industry sources estimate that energy comprises approximately one-third of the total cost of primary aluminum production. The Rockdale operation is typical of aluminum smelters, in that it was originally sited to be near the fuel source for low-cost electricity. As the existing fuel source from the Sandow Mine reaches its limits for economic production, any replacement fuel source used at the Rockdale generating facility must, in turn, be economically produced to maintain the availability of low-cost electricity.

1.4.1.1 Price Stability

The local lignite is the only fuel source that Alcoa can effectively own or control. This means that in addition to costs being low initially, they can be held stable for decades. For other energy sources, recent trends indicate variability and probable increases in cost over a relatively short time.

1.4.1.2 Overburden to Lignite Ratio

As the mining depth increases in a given mining area, the amount of overburden handled to produce the same quantity of lignite becomes much higher. This overburden to lignite ratio is one of the key factors determining the cost of fuel production.

1.4.1.3 Dewatering Requirements/Water Depressurization

Mining to deeper depths of the Carrizo-Wilcox lignite seam results in substantial increases in the pumping and discharge of water from the underlying aquifer to depressurize the area of the aquifer below the mine pits. This translates directly to substantial increases in operation costs.

1.4.2 Existing Technology

Alcoa's fuel cost objectives can only be met by using currently available and competitively priced technologies for extraction, transport, and combustion of the fuel. The available technology consists of

Alcoa's two existing draglines, the ability to transport the lignite by truck and/or conveyor, and the ability to combust the lignite using the existing boiler technology.

The existing technology is further constrained by the overburden depth and the associated slope stability in the unconsolidated overburden. Operating at greater depths with the existing draglines would lead to significant reductions in operational efficiency as well as increased safety issues with the relatively unconsolidated geologic materials in the pit highwall. Lignite extraction at deeper depths would likely require major capital investment for conversion to other methods such as bucket wheel excavators.

1.4.3 Logistics

The fuel source used at the Rockdale generating station must also meet various criteria regarding accessibility and reliability in order to ensure continuity of smelter operations. Assuming the use of local lignite, the following criteria must be met:

1.4.3.1 Legal Accessibility

The mineral reserves must be legally available to Alcoa.

1.4.3.2 Physical and Economic Accessibility

The mineral reserves must be available in a spatial orientation that enables effective mining operations. Thus, Alcoa must be able to acquire ownership or property control of sufficient contiguous reserves to facilitate efficient operations.

1.4.3.3 Dependable Quality and Supply

The mineral reserve must involve lignite seams of suitable quality and uniformity to provide a reliable fuel blend meeting the requirements of the generating station.

1.4.4 Practicability Criteria

For purposes of this evaluation, an alternative will be considered practicable with regard to cost if the alternative will provide stable and predictable power costs. Alcoa has identified this threshold as $1.25 per million British thermal units (MMBTU). Current production costs are approximately $1.05 per MMBTU at the Sandow Mine.

An alternative will be considered practicable with regard to technology if it is compatible with the existing equipment and technology and does not require a major expenditure of capital for new equipment and technology.

To be considered practicable from the standpoint of logistics, an alternative must provide a fuel source that is legally accessible, economically available, conducive to mining, and exhibits suitable quality and quantity to represent a dependable supply.

1.5 Alternatives Considered

The USACE has three alternatives available relative to its consideration of Alcoa's application for an individual permit pursuant to Section 404 of the CWA: 1) issue the permit for the project as described above in Section 1.2, 2) issue the permit with special conditions, or 3) deny the permit. Permit denial would be the No Action Alternative as described below in Section 1.5.1.

Alcoa considered a variety of alternatives during feasibility studies for the Three Oaks Mine, including the No Action Alternative. In addition, the USACE identified potential alternatives to the Three Oaks Mine based on issues identified during the scoping process and project evaluation. Alternatives to the proposed project are described below.

1.5.1 No Action

Under the No Action Alternative, the USACE would deny Alcoa's application for an individual Section 404 permit. As a result, the proposed Three Oaks Mine would not be developed, and the potential impacts to the natural or human environment identified for the Proposed Action would not occur. However, there would be impacts associated with the No Action Alternative, as described in Chapter 3.0 of the EIS, and the cumulative impacts associated with interrelated actions (described in Section 2.6 of the EIS) would likely occur.

Under this alternative, the identified lignite reserves at the proposed Three Oaks Mine would not be mined and used as fuel at the existing Alcoa and TXU power generating facilities at Rockdale. The No Action Alternative does not mean, however, that there would be no impacts to the lands in and near the Three Oaks Mine. The potential exists that Alcoa and City Public Service (CPS) would retain the property and utilize or lease the lignite reserve at a later date, or that some portion of the land would be sold for purposes of development. The USACE has chosen not to speculate on the nature of the future land use, and has not predicted these possible future impacts from the No Action Alternative. Note also that with No Action, there still would be regional impacts, as identified in the analyses of cumulative impacts, that are caused by activities other than the Three Oaks Mine; for example, aquifer drawdowns associated with regional pumping by entities other than Alcoa.

The No Action Alternative would likely force Alcoa to terminate existing operations at its aluminum smelter (Hodges 2001). The No Action Alternative, however, would not necessarily result in closure of the electrical generating units at the Rockdale facility since these units could be converted to use western coal, and the higher costs could be passed on to customers on the electrical grid. These options are discussed further in the following sections.

For purposes of this analysis, the USACE assumes that the No Action Alternative would result in closure of Alcoa's aluminum smelter. It is further assumed that the four electrical generating units would be converted to use western coal.

1.5.2 Alternatives Available to Alcoa

Alcoa considered various alternatives during feasibility studies for the Three Oaks Mine. In addition, the USACE identified potential alternatives to the Three Oaks Mine based on issues identified during the scoping process and project evaluation. The alternatives considered included alternatives to constructing and operating the Three Oaks Mine that involved alternate energy sources for the power plant and smelter (see Section 2.4.1 of the EIS); alternate plans for constructing, operating, and reclaiming the Three Oaks Mine itself (see Section 2.4.2 of the EIS); and using a combination of Three Oaks Mine lignite and another source of fuel (e.g., western coal) as a blended fuel source (see Section 2.4.3 of the EIS). All of these alternatives were considered relative to their technological and economic feasibility as well as their apparent likelihood to reduce environmental impacts. As discussed in Section 2.4 of the EIS, the USACE has reviewed the data and analyses provided by Alcoa and has conducted its own independent review of the associated costs. Based on the available data, the USACE believes Alcoa's analysis represents reasonable conclusions and rationale. Based on the USACE's evaluation, these alternatives have been considered but subsequently eliminated from detailed analysis in the EIS. This section describes the rationale for their elimination.

1.5.2.1 Alternative Lignite Sources

There are extensive lignite reserves in Texas, and many lignite mines are operational. Thus, it would be possible for Alcoa to obtain Texas lignite from a location other than the Three Oaks Mine site. However, lignite has a relatively low heat content and as a result, a larger quantity is required to generate power, compared to western coal. Consequently, transportation costs would be relatively high; therefore, as a practical matter, lignite development is limited to mines that are very close to the customer. For the Rockdale power generating units, there are three potential mine sites (in addition to Three Oaks) that have been considered:

- Deeper mining at the existing Sandow Mine;
- Following the Sandow Mine lignite seams to the northeast in Milam County (rather than to the southwest to the Three Oaks Mine area); and
- The Camp Swift area lignite reserve.

Deeper Mining at the Sandow Mine

Alcoa has been mining at Sandow for approximately 50 years. Nearly all of the lignite with less than 200 feet of overburden already has been mined. These lignite seams continue past the 200-foot depth line dipping toward the southeast. Theoretically, more lignite reserves could be acquired southeast of the existing mine, and Alcoa could continue to mine at greater depths to supply fuel for the power plant.

Alcoa considers this alternative not to be a viable option based on safety and economic considerations. Thousands of acres of new reserves would have to be acquired by Alcoa. Up to 400 feet of overburden also would have to be moved. In excess of $100 million of capital would have to be invested in earth-moving equipment capable of achieving such deep mining (probably bucket-wheel excavators). Safety and slope stability would be a major concern for mining in the unconsolidated overburden. All these factors would

substantially increase operating costs, which would make Rockdale smelter operations non-competitive in the global market

Mining at greater depths would require substantially increased pumping from the Simsboro aquifer to adequately depressurize the aquifer. It is anticipated that the increased pumping and the increase in surface disturbance would result in additional environmental impacts as well as costs. However, these impacts have not been evaluated in detail as Alcoa has determined, and the USACE agrees, that the increased water use, required capital expenditures, increase in operating costs, safety concerns, and uncertainties associated with mining at these depths make this an uneconomic alternative.

Milam Mine

Another lignite alternative considered by Alcoa is a reserve located in Milam County between U.S. Highways 77 and 79. This lignite reserve to the northeast of the Sandow Mine is commonly referred to as the Milam reserve.

This reserve was evaluated with respect to several criteria, including the following:

- Mining costs
- Lignite quality
- Overburden depth
- Overburden-to-lignite ratio
- Environmental impacts
- Dewatering requirements
- Depressurization requirements
- Reclamation feasibility
- Property control

Alcoa found the Three Oaks lignite reserve to have a number of important advantages over the Milam reserve. In particular, the Three Oaks reserve has a much lower overburden-to-lignite ratio than the Milam reserve, resulting in less disturbance area per ton of lignite mined. The Milam reserve would require greater amounts of groundwater withdrawal for depressurization and dewatering of the Simsboro aquifer than would be required at the proposed Three Oaks Mine, resulting in a potential increase in groundwater drawdown and other interrelated environmental impacts.

According to Alcoa, property sales and control issues in recent years have effectively eliminated the Milam reserve as a feasible option to supply lignite over the long-term. The original large contiguous land tracts have been divided into smaller tracts for development. Shell Mining Company, which originally controlled the Milam reserve, began acquiring lignite property in the mid-1970s and continued through the early 1990s. Shell transferred its rights to the reserve to another mining company in the mid-1990s, which subsequently sold them to another company. Alcoa negotiated with all of these companies, but no agreements were reached. The Milam reserve properties were sold to many individuals at approximately the same time that Alcoa entered into the lease agreement with CPS (1998). Alcoa began permitting activities immediately for the Three Oaks Mine with the goal to be mining in the 2003 to 2004 timeframe. The timing of the Milam reserve properties sale eliminated it as a viable alternative. The property acquisition for this type of project typically takes 10 to 15 years as indicated by CPS's time to acquire the Three Oaks reserve and by Shell's time to acquire the Milam reserve. Waiting an additional 10 years before permitting activities could begin was not feasible due to the small amount of reserves remaining at Sandow (Hodges 2002). The last

company to control the reserve as a logical mining unit sold individual parcels to many different individuals. Alcoa has indicated that the difficulty in acquiring contiguous parcels of the size needed for development of a mine would limit the viability of this alternative (Hodges 2001).

Camp Swift

The potential environmental effects of developing the lignite reserves at the Camp Swift Military Reservation in Bastrop County were considered and analyzed in an EIS prepared by the Bureau of Land Management (BLM) in 1980 (BLM 1980a,b). The BLM prepared the EIS in conjunction with the proposed competitive leasing of lignite reserves at Camp Swift. The proposed leasing action was in response to a hardship coal lease application submitted to the BLM by the Lower Colorado River Authority (LCRA) of Austin, Texas.

As noted in the Camp Swift EIS and stipulated in 43 CFR 3400.3-2, the lease of this mineral reserve is available by law only to public entities. Thus, it is not considered to be a viable fuel source alternative for Alcoa.

1.5.2.2 Alternative Energy Sources

Alcoa evaluated the following four energy supply alternatives to the mining and use of local lignite:

- The purchase of commercial electrical power from the grid;
- Conversion of the existing Rockdale power plant to use western coal;
- Conversion of the existing Rockdale power plant to use natural gas; and
- Use of a lignite/western coal blend at the Rockdale power plant.

Purchased Power

For the foreseeable future, there are adequate supplies of commercial electricity available in central Texas, and transmission capacity and infrastructure exist to deliver power to the Rockdale smelter. Thus, Alcoa considered purchasing the energy it needs for the smelter from the commercial grid and TXU's Unit 4. Presumably if this were done, Alcoa's three power generating units at Rockdale (that use lignite) would shut down, but the TXU plant would continue operation, thus still requiring a continued supply of lignite or conversion to another fuel. The TXU generating unit is projected to consume approximately two-thirds of the anticipated production from the proposed Three Oaks Mine.

Power for the local electrical grid is generated by burning lignite, western coal, oil, natural gas, or by using nuclear fuels. Price and availability of electricity are subject to market conditions. Current prices would make this alternative source non-economic as an electricity source for the Rockdale aluminum smelter (see Figure 2-1 of the EIS). Long-term availability and cost of power are not predictable and, thus, cannot be assumed to make electrical grid power any more competitive than at present.

In addition to the price of electricity from the local grid, Alcoa would face a number of additional conversion costs associated with this scenario that have not been considered and estimated in detail. These would include installation of additional transformers, capacitors, and other equipment to achieve compatibility with

and facilitate use of the 138-kilovolt (kV) grid power as opposed to the 13.8-kV power currently provided by the Alcoa generating units (Hodges 2002).

Nationwide, some aluminum smelters operate using local electrical grids. These grids, in turn, are operated by semi-governmental agencies, such as the Tennessee Valley Authority (TVA) and Bonneville Power Administration (BPA) within the U.S. Department of Energy. These agencies use hydropower from federally funded dams to generate inexpensive electricity. In addition, the TVA has the ability to negotiate long-term contracts with individual customers. However, in the case of the BPA, contracts have been renegotiated so that marginal power can be sold to higher bidders, such as California, leaving aluminum smelters to reduce production or close plants and lay off workers. As a result, the use of commercial electricity has been eliminated from further analysis based on the high cost of grid power and the potential for supply interruption.

Western Coal

Alcoa could modify its existing power generating units, and TXU could modify its existing power generating unit, to use western coal. Western coal used in Texas is typically mined in the Powder River Basin of Wyoming, and it is transported by either the Burlington Northern Santa Fe (BNSF) or Union Pacific Southern Pacific (UPSP) railroads to electric power generating plants located throughout the state. Those plants served by both railroads typically are able to negotiate lower rail tariffs due to competition. Alcoa's Rockdale smelter and power plant is only served by the UPSP, which could limit Alcoa's ability to negotiate favorable rail contracts. In addition, rail offloading and storage facilities would need to be installed at the power plant. In 1997, Alcoa commissioned an engineering feasibility study for use of Powder River Basin coal in Alcoa's three generating units. This study estimated that the cost of infrastructure and facilities needed to unload, store, and process western coal would be over $13 million. In addition to the delivery, storage, and handling facilities, this approach would require crushing, pulverizing, and handling equipment modifications estimated to cost $15 to 17 million (Hodges 2002).

Western coal contains less ash and sulfur and has a higher heat output than the lignite located within the proposed Three Oaks Mine. Only approximately 5 million tons per year of western coal would be needed to supply the existing plants, and there would be 30 to 40 percent less ash disposal required. Even with these savings, the cost of western coal per equivalent heat output would be higher than Three Oaks Mine lignite, due largely to transportation costs. Using coal prices averaged over the past 5 years, the USACE estimates that Powder River Basin coal delivered to Rockdale would cost approximately $1.49 per MMBTU (without drying). As a comparison, Alcoa's estimated cost for producing and delivering lignite from the Three Oaks Mine is approximately $0.95 per MMBTU (Hodges 2001). Thus, the Powder River Basin coal alternative would represent a direct fuel cost increase of approximately 57 percent. The USACE has reviewed fuel cost estimates in relation to documented fuel costs at other sites in central and eastern Texas. The cost estimate for western coal used by the Railroad Commission of Texas (RRC) (Walter and Blair 2000) is similar to and slightly below that derived by the USACE. Other economic factors related to the use of this alternative fuel source include:

- Capital cost of approximately $15 million to convert the TXU generating unit to western coal (Alcoa estimate);

- Capital cost of approximately $40 million to convert the three Alcoa generating units to burn western coal (Alcoa estimate);

- Transportation contracts are normally limited to 5 years and are adjustable based on variations in the price of diesel fuel;

- Loss of approximately 30 percent of output capacity for Alcoa's generating units operating on western coal that is not dried (Alcoa estimate);

- Most new contracts contain provisions that adjust the price to market every 5 years;

- Increase of approximately 30 percent in overall power production cost to operate a coal drying system as currently used for lignite to preserve the generating capacity of 120 MW per unit; and

- Existing costs for western coal would make smelting non-competitive, and future costs, especially those for transportation, are likely to increase.

As a result of the above cost and logistical factors, Alcoa has determined that this alternative would not be practicable.

Natural Gas

This alternative involves constructing a pipeline capable of providing 85 million cubic feet per day (MMCFD) of natural gas to the Rockdale power generating units and the expenditure of $100 million in capital costs for converting the existing generating units at Rockdale to burn natural gas (Hodges 2001). There would be some operational cost savings resulting from the minimal need for emissions controls and ash disposal. However, additional factors considered by Alcoa included the following:

- Deregulation of wellhead natural gas prices and restructuring of interstate pipeline transportation have led to the establishment of a highly competitive and complex natural gas market that experiences marked short-term price fluctuations;

- The overall price of natural gas can be expected to increase in the future based on current trends; and

- Natural gas prices are expected to be higher and more unpredictable than lignite or western coal prices.

As a result, the overall cost of electricity from the existing power plants, even without the capital costs of conversion, would more than double due to the higher cost of the natural gas (see Figure 2-1 of the EIS). Thus, Alcoa does not consider this alternative to be practicable (Hodges 2001).

Blend of Lignite and Western Coal

This alternative would involve a combination of lignite mined in a reduced scale operation at the Three Oaks Mine with use of western coal to achieve a higher MMBTU fuel blend. The blended fuel would be expected to produce less ash, less local air pollution, and higher energy levels per ton of fuel consumed than the burning of lignite alone. Additional offloading and storage facilities would be required at the generating plants to handle the addition of western coal and produce the desired blend characteristics. Alcoa has examined this alternative and considers it to be economically infeasible for the following reasons:

- Like the conversion to use western coal alone, this alternative would require the installation of rail offloading and storage facilities estimated to cost approximately $30 million;

- The reduced output from the Three Oaks Mine would result in higher per-unit cost of lignite produced at the facility due to reduced economies of scale; and

- The western coal involved is higher priced by 57 percent than the expected production costs of the Three Oaks lignite (approximately $1.49/MMBTU versus $0.95/MMBTU).

In summary, fuel blending appears to offer no economic advantage to a total conversion of the generating units to burn western coal alone: that alternative is discussed in Section 2.4.1.2 of the EIS and also is considered economically infeasible for most of the same reasons. In addition, a fuel blending alternative would result in land disturbance at both the Three Oaks Mine and at the location of the source of western coal. The extent of this disturbance is unknown.

1.5.2.3 Construction and Operation Alternatives for the Proposed Three Oaks Mine

Mine Layout and Sequencing Alternatives

Alcoa evaluated different mine pit orientations. Strike-oriented pits (pits excavated parallel to the geologic strike of the lignite seam) would run in a southwest to northeast direction (roughly parallel to the direction of Farm-to-Market [FM] 696). Dip-oriented pits (pits excavated perpendicular to the geologic strike of the lignite seam) would run perpendicular to strike pits. Strike pits have the advantage of consistent, shallow overburden in the early years of mining and the disadvantage of consistently deep overburden in the later years. Generally, dip pits allow a much more consistent overburden removal requirement over the life of the mine. Several geologic faults exist in the Three Oaks reserve. These faults generally run parallel with the strike pit direction, and thus favor the strike-oriented pits. Dip pits would require having to frequently ramp the draglines up and down steep slopes. The public road reroute requirements for these two alternatives also are quite different. Dip pits would require that FM 696 be rerouted to the southeast of the mine and intersect U.S. Highway 290 approximately 2 or 3 miles east of its existing intersection. Strike-oriented pits allowed for the reroute of FM 696 northwest of the mine, leaving its intersection with U.S. Highway 290 intact. The northwest reroute would be much less disruptive to the traveling public. Alcoa has selected to use strike pits due to the problems associated with the faults and to minimize impacts to FM 696.

Overburden Removal Alternatives

Alcoa considered both surface mining and underground mining methods; however, underground mining is not feasible in this setting. The unconsolidated overburden does not have the strength necessary for underground mining to be conducted safely.

Alcoa considered alternatives involving three methods of overburden removal: 1) utilizing Alcoa's two existing draglines from the Sandow Mine, 2) using one of Alcoa's draglines in combination with a large truck/shovel fleet, and 3) utilizing a large truck/shovel fleet with no draglines. Draglines generally are the most capital-intensive alternative, but they remove overburden at a lower cost than trucks/shovels over a long period of time. Trucks/shovel fleets are much more flexible than draglines due to their mobility. All of these alternatives allowed for appropriate reclamation of the land after mining. Ultimately, the use of two draglines was selected, as Alcoa had already invested the capital for these machines. Alcoa estimated the initial capital expenditure required to implement a truck/shovel operation to be between $40 and $45 million (Hodges 2002).

Lignite Transport Alternatives

Alcoa has evaluated two alternatives for lignite transportation: 1) trucks and 2) conveyors. Trucking requires less up-front capital expenditures, but the labor, maintenance, and fuel costs are higher. Conveyors are expensive to construct but are cheaper to operate in the long term. Alcoa is still evaluating the conveyor option due to the long-term financial implications.

Water Reuse and Disposal Alternatives

As part of the proposed Three Oaks Mine, water from dewatering or depressurization not used for mining purposes, such as dust suppression and vehicle washing, would be discharged directly to area streams, or piped to a public water supply system.

The alternative exists for Three Oaks Mine water to be used for power plant cooling and other processes associated with manufacturing activities. With this alternative, pumping for these purposes from the Sandow Mine would be replaced with a pipeline from the Three Oaks Mine. A new pipeline to replace the existing pipeline from the Sandow Mine to the Rockdale facilities would be much longer and more costly than using the existing facilities and would result in additional pumping costs. Further, depressurization water from the Three Oaks Mine is owned by San Antonio Water System (SAWS), and SAWS may not relinquish their water rights. For these reasons, this alternative has been determined not to be practical and has not been considered further by Alcoa.

Aquifer Reinjection/Reinfiltration at Simsboro Outcrop

Another alternative for discharge of excess water pumped for dewatering and depressurization at the Three Oaks Mine would be to pipe the excess water to the Sandow Mine area and allow it to reinfiltrate or inject it into the Simsboro outcrop. Theoretically, this disposal approach would tend to accelerate the recovery of the aquifer drawdown resulting from the Sandow Mine. While this alternative does not address potential impacts

projected from the Three Oaks Mine, it would likely alleviate cumulative pumpage impacts in the vicinity of Sandow Mine. Negative considerations for Alcoa include: 1) the cost of acquiring, if possible, the necessary water rights from SAWS; 2) the cost of constructing and operating a pipeline for several miles from the Three Oaks Mine area to the Simsboro outcrop, probably near the north end of the Sandow Mine; 3) the fact that most of the Simsboro outcrop area near the Sandow mine is private property not controlled by Alcoa, necessitating expensive land acquisition for infiltration basins; and 4) potential slight reduction in the depressurization efficiency at the proposed mine caused by accelerated recovery of the Simsboro drawdown. Alcoa has estimated the cost of pipeline, pumping facilities, and infiltration basins for this alternative to be approximately $75 million, without including the cost of acquiring the water rights (Hodges 2002).

1.6 General Description of Dredged or Fill Material

1.6.1 General Characteristics of Material

Native soils in the permit area are discussed in detail in Section 3.3.1.1, Native Soils, of the Three Oaks Mine EIS. Intensive investigations have shown the native soil materials to be less suitable for reclamation purposes than other materials that can be retrieved on the site (Alcoa 2000 [Volume 9]) (see Section 3.3.2.1, Proposed Action, Surface Disturbance).

To promote site stabilization and revegetation to meet post-mining land use objectives, Alcoa proposes to select suitable growth media substitutes from overburden and interburden materials encountered during the mining process. Except in those areas where prime farmlands exist and the associated prime farmland soils will be salvaged in accordance with RRC regulations, the suitable growth media materials are proposed for use in place of native soil on the basis that they have better suitability for successful restoration of productive post-mining land uses.

Alcoa's investigations indicate that large volumes of suitable alternative growth media exist within the overburden and interburden strata in the proposed mine area, sufficient to replace a 4-foot depth of cover on the area disturbed by mining. The RRC guidelines for topsoil substitution will be used in identifying and selecting suitable substitute materials. These are presented in **Table A-1**.

The reconstructed growth media are anticipated to have post-mine soil textures with an improved balance of sand, silt, and clay, and are not expected to display the adverse physical characteristics of the native soils (i.e., excessive sand and clay). Based on reclamation procedures at the existing Sandow Mine, it is anticipated that successful site stabilization and restoration of productive post-mining land uses would occur at the Three Oaks Mine as required by RRC regulation

1.6.2 Quantity of Material

Approximately 215,442 cubic yards (yd^3) of dredged and fill material would be placed into waters of the U.S. over the life of the proposed mine. A total of 5.3 acres of wetlands, 19.9 acres of ephemeral stream channels, 3.7 acres of intermittent stream channels, and 38.5 acres of on-channel ponds would be adversely impacted due to mining activities. The direct impacts to these 67.4 total acres of waters

Table A-1
General Suitability Criteria for Topsoil used in Reclamation

Suitability Parameter	RRC Recommended Criteria
pH (standard units)	≥ 5.0 to ≤ 8.4
ABA or NNP (tons/kiloton)	≥ 0
Sand (percent of fraction < 2 mm diameter)	≤ 80
Clay (percent of fraction < 2 mm diameter)	≤ 40
Electrical Conductivity (mmhos/cm)	≤ 4.0
Sodium Adsorption Ratio (SAR)	≤ 13
Boron (ppm)	≤ 5
Cadmium (ppm)	≤ 0.7
Molybdenum (ppm)	≤ 5
Selenium (ppm)	≤ 2

Note: ppm = parts per million.
ABA = acid base accounting.
NNP = net neutralization potential.

Sources: RRC 1988; Alcoa 2000 (Volume 9); Hodgkiss 2001.

of the U.S. would occur as a result of excavation of the mine pit and construction of ancillary facilities, including haul roads, conveyors, storage buildings, parking lots, and storm water control structures.

1.6.3 Source of Material

The majority of material placed into waters of the U.S. would be either:

- Native soils and subsoil materials for the affected sites (drainage channel crossings) along the transportation corridor; or

- Mixed geologic materials from the Calvert Bluff Formation for affected sites (drainage channels and wetland areas) in the proposed mine area itself.

1.7 Description of the Proposed Discharge Site

Soil materials and underlying geologic strata above the lignite seams to be mined generally would be removed from wetlands and waters of the U.S. within the mine area with the surrounding upland soils and overburden materials. Such materials excavated by the dragline would be placed on the back, or mined out, side of the pit as the pit advances to expose additional lignite. Similarly, materials being placed in locations previously characterized by wetlands or waters of the U.S. generally would be mixed run-of-mine overburden. An exception would occur in areas of prime farmland soils, where the topsoil would be salvaged separately and reapplied following spoil grading and contouring. In the remainder of the mine area, overburden strata with favorable chemical and physical characteristics would be selectively handled to ensure that the top layer of the replaced material provides a suitable growth medium for vegetation reestablishment. Thus, materials immediately underlying and adjacent to the redesigned drainage channels in the mined area would be suitable growth medium for reestablishing the desired reclamation species.

1.8 Description of Disposal Method

Soils and overburden materials disposed of into the former wetlands and waters of the U.S. typically would be disposed of by directly dumping these materials from the dragline bucket into the former mine pit area. The dragline operations would produce overlapping ridges of spoil material that will subsequently be reshaped by dozers to achieve the desired post-mine topography. Where necessary, prime farmland topsoil or selected overburden material would then be distributed on the surface by scrapers or trucks and dozers to a minimum depth of 4 feet to ensure a suitable revegetation growth medium

2.0 FACTUAL DETERMINATIONS

2.1 Physical Substrate Determinations

2.1.1 Substrate Elevation and Slope

Waters of the U.S. and wetlands that are restored as part of this project would be constructed to elevations and slopes as close to the existing conditions as possible.

2.1.2 Sediment Type

The sediments contained within the impacted wetlands and waters of the U.S. are predominantly clays produced from the surrounding upland soils described above. The fill material to be placed into the wetlands and waters of the U.S. will consist of a mixture of topsoil and overburden materials removed from the area being mined. The materials placed at the surface will be selected to ensure their suitability as plant growth materials.

2.1.3 Dredged/Fill Material Movement

The vast majority of soil and overburden material removed from jurisdictional areas would be excavated by the dragline from the undisturbed side of the mine pit and dumped across the pit floor into the previously mined out portion of the pit with a single arc of the dragline boom. Thus, the initial movement would be approximately the distance across the mine pit (pit floor width is approximately 140 feet). As described above in Section 1.8, additional movement of materials placed in the spoil ridges would occur as these ridges are recontoured with dozers and scrapers to reach the desired final topographic configuration. In this latter operation, the dredged material may be moved in almost any direction from its initial point of deposit by the dragline, but distances for relocating such material would be minimized for operational efficiency.

2.1.4 Physical Effects on Benthos

There are no perennial streams among the waters of the U.S. occurring in the permit area. Thus, benthic macroinvertebrates potentially affected by the project would generally be restricted to intermittent streams and the variety of jurisdictional and non-jurisdictional surface impoundments (stock ponds) with seasonal pool habitat throughout the permit area. Surface waters within the proposed disturbance areas (including

69.9 acres of pond habitat, (38.5 acres of jurisdictional, on-channel ponds and 31.4 acres of non-jurisdictional, isolated ponds) 23.6 acres of intermittent/ephemeral stream, and 5.3 acres of herbaceous wetland) would be physically removed by mining or filled during construction activities. Consequently, benthic organisms in these water bodies would be lost. These losses would not occur simultaneously, but would occur in a staged progression as mining activities incrementally affected additional ponds or stream channel segments throughout the life of the operation. These incremental losses of aquatic habitat would be offset, in part, by the incremental creation of new ponds and replaced drainage channels in the areas being reclaimed as the mining operations progress through the site. Aside from the physical loss of aquatic habitat, changes would occur in the flow regime of ephemeral and intermittent streams during and after mining due to surface water diversions during mining, installation of detention ponds, depressurization and dewatering activities, and creation of end lakes at the end of operations. These changes would be expected to affect the composition and abundance of benthic communities in the affected stream reaches.

During reclamation of the mined area, it is expected that approximately 895 acres of developed surface water features would be created including approximately 173 acres of various sized ponds plus two end lakes totaling 722 acres. Additionally, approximately 33.9 acres of ephemeral or intermittent stream channel and 10.6 acres of wetland would be created during reclamation. As indicated in Alcoa's Mitigation Plan for Proposed Three Oaks Mine (Appendix E of the EIS), a portion of this mitigation would occur within the proposed disturbance area following mining, and the remainder would occur outside the disturbance area within the proposed Middle Yegua Mitigation Site. Benthic communities would re-establish within the new surface water features. Benthic communities also would establish in the temporary water features present during the active mining operations including the diversion channels, sedimentation/detention ponds, and relocated drainage channels in the reclaimed areas. It is anticipated, however, that the alteration of flow regimes and impoundment conditions from those present in the pre-mining environment would lead to corresponding changes in the presence and abundance of various benthic organisms. Thus, the overall benthic communities during and following mining may be substantially different than the existing communities.

Best Management Practices (BMPs) would be implemented to control erosion and sedimentation at the drainage crossing sites. However, it is possible that limited amounts of sediment may escape during major precipitation events to enter the downstream perennial portions of these drainages. This potential offsite sedimentation could affect benthos in such areas. Discharges from the sediment ponds would likely have less suspended solids than the existing pre-disturbance discharges (based on comparing baseline monitoring data to anticipated water quality). The potential reduction in suspended solids and reduced potential for occasional channel flooding may result in conditions favoring different benthic organisms than those that currently dominate local communities.

2.1.5 Other Effects

None anticipated.

2.1.6 Actions Taken to Minimize Impacts

During operations, Alcoa would use BMPs to limit erosion and reduce sediment transport as a result of storm water runoff from proposed project facilities and disturbance areas. Surface water control facilities would be constructed prior to other components in order to control runoff from disturbance areas, including the initial mining area, support facilities, and infrastructure area. These facilities would include a combination of diversion ditches, sediment ponds, and other control structures or techniques designed to minimize erosion and improve surface water quality discharge from the site. Each structure would be planned and constructed according to requirements of the RRC and utilize processes currently used at the existing Sandow Mine. Six diversion ditches and seven sediment ponds would be constructed during the initial phase. Additional ditches and ponds would be added incrementally over the life of the mine to divert and route storm water and control sediment in surface water runoff, respectively, from lands newly disturbed during advancement of the mining operation. Other control structures or techniques that would be used include riprap channels, check dams, temporary vegetation in diversions, sod installation in waterways, booms or baffles to increase mixing and effective retention time in the sediment ponds, and managed discharges from sediment ponds to control flow and detention time.

Prompt and effective revegetation of disturbed areas would further reduce the potential for erosion. Following construction activities, disturbed areas such as cut-and-fill embankments, topsoil and subsoil stockpiles (if left in place over 30 days), and other temporary site disturbance would be seeded. All sediment and erosion controls would be inspected periodically, and repairs would be performed as needed. It is expected that at any time in the mine life approximately 640 acres of mine disturbance area would exist, including areas where existing vegetation has been removed, mining operations are underway, or recontouring of mine spoil is underway.

Routine and seasonal site maintenance would include inspection and repair of drainage and sediment control facilities and installed erosion controls, routine grading and related landform maintenance to maintain site drainage patterns, the cleaning of sediment ponds and ditches, and the resurfacing of roads as needed.

Reclamation would be initiated as soon as practicable following the initial mine pit development and would continue concurrent with mining operations throughout the life of mine and through final closure. The short-term reclamation goals would include soil stabilization and prompt establishment of a vegetative cover to minimize erosion. On a long-term basis, the reclamation program is designed to create stable, productive plant communities and naturally appearing land forms effective in controlling erosion while meeting the desired post-mine land use objectives. As indicated in Section 6.3 of Alcoa's Mitigation Plan (Appendix E of the EIS), the temporary stream channels designed and used for flood flow and erosion control during mining operations would be eliminated following mine closure and replaced with more natural stream channels forming a dendritic pattern. Numerous permanent channel segments would be planted and managed as wooded riparian corridors. The initial reclamation communities would logically change slowly over time as various plant species from the neighboring undisturbed areas gradually invade the mined area and contribute to the overall species diversity of the site. Depending on their competitiveness in the reclamation environment, they may or may not end up displacing some of the species planted during the reclamation process.

2.2 Water Circulation, Fluctuation and Salinity Determinations

2.2.1 Water

2.2.1.1 Salinity

Not applicable.

2.2.1.2 Water Chemistry

Surface water quality issues associated with lignite mining generally involve the potential for increased sediment transport, nutrient and pesticide loading, and acid or toxic drainage resulting in increases in iron, manganese, or total dissolved solids (TDS). Sediment, metals, and metalloids can be treated by flocculation or other chemical methods to reduce their concentration. TDS may increase in mine area discharges, depending on the nature and timing of groundwater contributions to the sediment pond/storm water management system. Information relative to the design, construction, and operation of the proposed surface water control facilities is presented in Sections 2.5.1.1 and 2.5.2.1 and the Surface Water Quality Impacts subsection of Section 3.2.4.2 of the EIS. Discharges during the life of the mine would be treated, as required, to meet Texas Pollutant Discharge Elimination System (TPDES) and RRC criteria. Adequate water treatment technologies (including retention, settling, and the use of flocculants) have been demonstrated at the existing Sandow Mine and would be implemented as part of the Three Oaks Mine surface water management system as described in Section 2.5 of the EIS.

Fertilizers and pesticides would be applied on reclaimed areas, as needed, to ensure successful reclamation. The fertilizers and pesticides proposed for use at the site are identified in Section 2.5.3.5 of the EIS. These materials would be applied in accordance with recommended application rates and procedures and are not anticipated to constitute a risk to water quality in local streams or groundwater as discussed in the Surface Water Quality Impacts subsection of Section 3.2.4.2 of the EIS.

During operation, any groundwater from pit dewatering and surface runoff from disturbed areas not used for dust control would be diluted with surface runoff during higher flow events, or alternately diluted with depressurization water from the Simsboro aquifer, prior to release. As discussed in the Surface Water Quality Impacts subsection of Section 3.2.4.2 of the EIS, an analysis was conducted by R. W. Harden & Associates, Inc. to evaluate the effects of discharging pit water through the surface water control system. Based on this analysis, surface water quality downstream of the permit area during periods of discharge likely would be within the normal range of variation for the respective drainages. In addition, routine monitoring and treatment, as necessary, of discharged waters would be conducted in accordance with TPDES and RRC criteria.

Isolated groundwater seeps and small springs may occur at lower elevations in the reclaimed SP-1/RPC-1 drainage (see Figure 2-9 in the EIS). Selective handling of overburden and interburden, as described in Section 2.5.2.6 of the EIS, and sampling and analysis of spoil groundwater, as identified in Table 2-15 of the EIS, are proposed to minimize the potential for acid or toxic drainage from the project in the post-mining

setting. Assuming prior identification of these materials and their deep burial within the pit, any seepage that may occur in this drainage following reclamation would not come into contact with acid-generating or toxic material. In addition, the high carbonate content in the mixed spoil and demineralization from cation-exchange with clays in the mine spoil are anticipated to bring any groundwater seepage from reclaimed Calvert Bluff sources to within the range of undisturbed background conditions in the region. (Refer to the Surface Water Quality Impacts subsection of Section 3.2.4.2 in the EIS.) As a result, any seeps or small springs that may occur in the drainage would have minimal effects on surface water quality, including iron, selenium, manganese, and TDS levels.

As discussed in the Surface Water Quality Impacts subsection of Section 3.2.4.2 in the EIS, the proposed project would not affect groundwater quality in the Simsboro aquifer, which provides baseflow to some of the creeks in the area. In addition, most of the surface water flow in the vicinity of the project area originates from precipitation events. As a result, neither the quality of the baseflow nor the decrease in baseflow would substantially affect the water quality in the gaining stream reaches associated with the Simsboro outcrop.

2.2.1.3 Clarity

Increases in suspended particulate and increased turbidity temporarily could reduce light penetration. This effect would be short in duration as the particulates should settle rapidly. However, implementation of BMPs (including the use of flocculants) during construction and operation would minimize, if not eliminate, increases in suspended particulates and turbidity. In addition, the construction and operation of the surface water control facilities as described in Sections 2.5.1.1 and 2.5.2.1 of the EIS; the construction and implementation of appropriate erosion control measures, the planting of cattails and bulrush around the perimeter of each constructed pond, the proposed design and installation of the temporary and permanent stream channels as described in Table 2-15 of the EIS; and the proposed concurrent reclamation program as described in Section 2.4.3 of the EIS would further minimize potential increases in suspended particulates and turbidity both during and following construction and operation.

2.2.1.4 Color

The proposed project would have no effect on water color.

2.2.1.5 Odor

The proposed project would have no effect on water odor.

2.2.1.6 Taste

The proposed project would have no effect on water taste.

2.2.1.7 Dissolved Gas Levels

An increase in turbidity would be temporary and would not affect oxygen content of intermittent and perennial stream reaches or perennial pools. Placement of fill in the headwater segments of local streams is

not anticipated to affect dissolved oxygen within the downstream perennial reaches of these streams since sediments arising from the mine activities would be captured by onsite erosion and sediment control ponds and structures.

As discussed in the Surface Water Quality Impacts subsection of Section 3.2.4.2 of the EIS, water quality data from field sampling indicate that groundwater discharge temperatures would be similar to surface water temperatures in the vicinity of the mine, and, therefore, would not be anticipated to affect dissolved oxygen levels. In addition, discharge waters would be required to meet state water quality standards for both temperature and dissolved oxygen.

2.2.1.8 Nutrients

Fertilizers would be applied on reclaimed areas, as needed, to ensure successful reclamation (see Section 2.5.3.5 of the EIS). As discussed in the Surface Water Quality Impacts subsection of Section 3.2.4.2 of the EIS, nutrient-rich runoff from the reclaimed areas could result in periodic increases in nutrient levels in nearby sediment ponds and diversions. These runoff episodes could produce corresponding increases in algal species abundance in these waters. However, it is not anticipated that the use of fertilizers during active reclamation would result in an upward trend in nutrient levels in receiving streams, based on current water quality monitoring data from locations directly downstream of reclaimed areas at the existing Sandow Mine.

2.2.1.9 Eutrophication

The proposed project would have no effect on eutrophication.

2.2.1.10 Others as Appropriate

None.

2.2.2 Current Patterns and Circulation

2.2.2.1 Current Patterns and Flow

Flow patterns associated with the various streams and drainages within the project site would be altered as mining progresses. Temporary routing of the affected streams and drainages would be implemented as necessary with each mine pit. Channel routing and engineering characteristics of diversion channels and replaced drainages on reclaimed surfaces during mining operations would be designed primarily for flood flow and erosion control. The overall surface water handling system for the project is described in Section 2.5.2 of the EIS. The channels within and immediately around the active mine area would flow primarily in response to local precipitation events, attenuated in lower stream reaches by the presence of intervening sediment ponds. Flow in Mine Creek/Middle Yegua Creek below sediment pond SP 1 and in Chocolate Creek/Big Sandy Creek below Outfall 003 would be augmented by water discharged from the mine depressurization/dewatering program. This flow augmentation would render these segments perennial during the period of water discharge (through year 2013 and potentially for the life of the mine).

Following mine closure, the stream channels within the mined area would be reconfigured to a more natural pattern and design in accordance with Section 6.3 of Alcoa's Mitigation Plan (Appendix E of the EIS). In addition, the discharge of water for depressurization/dewatering would cease (if still ongoing at the end of mining), and the final mine pits would be allowed to fill with water (as end lakes) and would overflow periodically in response to precipitation events. These processes would restore many of the characteristics of the existing ephemeral/intermittent stream channel network. Although substantial differences in the drainage pattern would persist indefinitely, particularly with regard to end lakes, permanent ponds, and the tributaries located immediately downstream of these impoundments, the replaced channels are expected to eventually function in a similar manner to those currently existing on the site. Effects from the watershed modifications are described in Section 3.2.4.2 of the EIS.

2.2.2.2 Velocity

No perennial streams, except Middle Yegua Creek, exist within or immediately downstream of the proposed disturbance area. Thus, there would be minimal impacts to perennial stream reaches or their associated velocities. Intermittent and ephemeral drainages within the disturbed area would be rerouted around the active mining operations, and permanent drainages would be reestablished within the reclaimed mine area. Gradients of the temporary diversion ditches and the reestablished drainages would not be identical to the existing channel conditions, but would be within the range of naturally occurring stream gradients in the area. For certain reaches of ephemeral and intermittent tributaries downstream of end lakes, velocities may be altered.

2.2.2.3 Stratification

Not applicable.

2.2.2.4 Hydrologic Regime

As discussed in Section 2.2.2.1 above, various drainages, wetlands, and streams within the proposed disturbance area would be affected as mining activities progress through the project site. These effects would differ during and following mining as discussed above, but the magnitude of these effects would be most noticeable within the affected channels of the permit area itself. Effects to downstream receiving waters are expected to be limited, except for the proposed flow augmentation in Big Sandy Creek, which would artificially create perennial reaches of that stream that are now ephemeral or intermittent. The augmented flow would not continue after mining operations, but other minor changes in the hydrologic regime are expected to persist for several decades or even indefinitely following mining. It is expected that the mine dewatering/depressurization activities would tend to reduce seepage flow into intermittent stream reaches, and the presence of the end lakes would tend to attenuate peak flood flows in response to precipitation events. These and other effects from watershed modifications are analyzed in Section 3.2.4.2 of the EIS. The presence of detention ponds and end lakes in the mine area watershed is expected to result in fewer and smaller flood flows to the reaches of Mine Creek, Middle Yegua Creek, Chocolate Creek, Big Sandy Creek, and minor tributaries of these streams immediately downstream of the mine. Because of the limited watershed areas involved and the fact that the mine would be located on the drainage divide

between Big Sandy Creek and Middle Yegua Creek, these reduced flood flow effects would be of little consequence to downstream reaches of these streams below their confluence with other major tributaries.

2.2.3 Normal Water Level Fluctuations

The flow augmentation in Big Sandy Creek and Middle Yegua Creek would create or maintain artificially perennial flows in stream segments that are naturally ephemeral or intermittent. As discussed above, long-term effects persisting beyond the mining operations likely would include fewer and smaller flood flows in the reaches of Mine Creek, Middle Yegua Creek, Chocolate Creek, Big Sandy Creek, and minor tributaries of these streams immediately downstream of the mine.

2.2.4 Salinity Gradients

Not applicable.

2.2.5 Actions That Would be Taken to Minimize Impacts

BMPs would be implemented to ensure that siltation and erosion are minimized during the mining activities. Affected streams, drainages, and wetlands would be restored or recreated following completion of the various mine pits. Following mining, the permanent drainage channels would be modified in accordance with Alcoa's Mitigation Plan (Appendix E in the EIS) to simulate natural conditions, where practicable.

2.3 Suspended Particulate/Turbidity Determinations

2.3.1 Expected Changes in Suspended Particulates and Turbidity Levels in the Vicinity of the Mine

There may be temporary increases in suspended particulates and turbidity immediately downstream of the mine disturbance area. These increases, should they occur, would be short-term and would not adversely affect aquatic organisms downstream. Construction and operation of the proposed surface water control facilities and implementation of BMPs, committed environmental protection measures, and concurrent reclamation, as presented in Section 2.5 of the EIS, would further minimize any localized increases in suspended particulates and turbidity both during and following construction and operation. In addition, all discharges during the life of the mine would be treated, as necessary, to meet TPDES criteria.

2.3.2 Effects on Chemical and Physical Properties of the Water Column

2.3.2.1 Light Penetration

Increases in suspended particulate and increased turbidity could temporarily reduce light penetration. This would be short in duration as the particulates should settle rapidly. However, implementation of BMPs (including the use of flocculants) during construction would minimize, if not eliminate, increases in suspended particulates and turbidity. Implementation of committed environmental protection measures and concurrent reclamation, as presented in Section 2.5 of the EIS, would further minimize any localized

increases in suspended particulates and turbidity, and the resulting effects on light penetration, both during and following construction and operation.

2.3.2.2 Dissolved Oxygen

An increase in turbidity would be temporary and would not affect oxygen content of intermittent or perennial stream reaches or perennial pools. Placement of fill in the headwater segments of local streams is not anticipated to affect dissolved oxygen within the downstream perennial reaches of these streams since sediments arising from the mine activities would be captured by onsite erosion and sediment control ponds and structures.

As discussed in the Surface Water Quality Impacts subsection of Section 3.2.4.2 of the EIS, water quality data from field sampling indicate that groundwater discharge temperatures would be similar to surface water temperatures in the vicinity of the mine, and therefore would not be anticipated to affect dissolved oxygen levels. In addition, waters discharged under a TPDES permit would be required to meet state water quality standards for both temperature and dissolved oxygen.

2.3.2.3 Toxic Metals and Organics

Acid or toxic drainage from the project would be avoided by selective handling of the overburden and interburden to achieve burial of any acid-forming materials near the bottom of the replaced mine spoils, as discussed in Section 2.5.2.6 of the EIS. In addition, the high carbonate content in the mixed spoil and demineralization from cation-exchange with clays in the mine spoil are anticipated to bring any groundwater seepage from reclaimed Calvert Bluff sources to within the range of undisturbed background conditions in the region. (Refer to the Surface Water Quality Impacts subsection of Section 3.2.4.2 in the EIS.) As a result, no release of toxic metals or organics is anticipated from the proposed project.

2.3.2.4 Pathogens

Not applicable.

2.3.2.5 Aesthetics

The waters of the U.S. that would be affected are primarily ephemeral and intermittent drainages with small additional areas of herbaceous wetlands. The drainage areas involved currently support a combination of riparian woodland, upland woodland, mesquite grassland, and grassland. The majority of these drainages and wetlands are remote from the existing roadways and other public access points; hence, they are not commonly viewed by the public. Aesthetic quality of the areas ranges from heavily grazed or even denuded ephemeral channels to densely wooded riparian woodlands along intermittent or major ephemeral channels. Aesthetic quality of these drainages would be impacted from the time that they are initially disturbed by construction or mining operations until they are individually reclaimed (typically a 3- to 5-year period). The temporary loss of these drainages in the proposed disturbance area would be localized to the current and most recent mine pit. Adverse impacts on aesthetics would be reduced as the completed mine pits are

reclaimed. Thus, only a small fraction of the total proposed mine disturbance area physically would be disturbed and stripped of vegetation at any one time.

2.3.2.6 Others as Appropriate

None.

2.3.3 Effects on Biota

2.3.3.1 Primary Production, Photosynthesis

Primary producers in the ephemeral and intermittent creeks, ponds, and stock ponds within the Big Sandy and Middle Yegua drainages include phytoplankton in pools and ponds, attached algae (periphyton), and macrophytes. Once mine discharges enter these streams, plant communities would mainly consist of periphyton, which is characteristic of perennial flows and mixtures of riffles, runs, and pools. Short-term, local increases in suspended sediment could occur in stream segments situated downstream of the disturbance areas. These short-term increases in sediment could result in temporary reductions in primary production. However, potential changes would be limited to several miles or less in relation to the disturbance areas. By implementing the proposed drainage design including detention ponds and erosion control measures, the impact of increased sediment levels on primary producers would be minor. No effects on primary production are expected in lower Big Sandy Creek, Middle Yegua Creek, or the Colorado River.

2.3.3.2 Suspension/Filter Feeders

Suspension or filter-feeding organisms in the intermittent stream segments and ponds are presently limited due to predominance of soft-bottomed substrates and lack of stream flows. The type of macroinvertebrate feeding in these habitats mainly consists of scrapers and predators. Once mine discharges enter these streams, suspension or filter-feeding macroinvertebrates represented by mayflies and caddisflies could become established in the riffle and run habitats. Short-term, localized increases in sediment could result in temporary reductions in suspension or filter feeders in riffle and run areas of stream segments located immediately downstream of disturbance areas. However, these potential changes would be limited to several miles or less in relation to the disturbance areas. By implementing proper drainage design including detention ponds and erosion control measures, the impact of increased sediment levels on filter-feeding macroinvertebrates would be minor. No effects on filter-feeding macroinvertebrates are expected in lower Big Sandy Creek, Middle Yegua Creek, or the Colorado River.

As discussed in Section 3.5.2.1, depressurization of the Simsboro aquifer would result in flow reductions in the gaining reaches of the Big Sandy drainage. For those areas located upstream of the discharge points, there would be a reduction in aquatic habitat. Since habitat in these areas is mainly intermittent/ephemeral stream reaches, filter-feeding and suspension-feeding macroinvertebrates are expected to be a minor part of the aquatic community. In areas located downstream of the discharge points, a net increase in flow would occur, which would create additional aquatic habitat. Filter-feeding or suspension feeding macroinvertebrates may colonize any perennial pools that are created. In addition, water discharge during

mining would result in a net increase in aquatic habitat below the discharge points. Flow increases could provide pool habitat for suspension and filter-feeding macroinvertebrates.

During the post-mining phase of the project, flows and the amount of habitat would decrease mainly due to watershed modifications made as part of reclamation. The effect of reduced flows on filter and suspension feeders would occur in any perennial or intermittent pool affected by flow reductions.

2.3.3.3 Sight Feeders

Sight-feeders present within and downstream of the project study area include fish species representing the minnow, sunfish, livebearer, killifish, and catfish families. Game fish species consist of sunfishes, catfishes, and low numbers of largemouth bass. These fish species feed on a variety on invertebrates and small fish. Short-term, localized increases in sediment could reduce the visibility for sight-feeders in segments located immediately downstream of disturbance areas. However, effects are considered minor due to the short-term duration of sedimentation, ability of fish to move to less turbid areas to feed, and the use of erosion control measures as part of mine operation.

2.3.4 Actions Taken to Minimize Impacts

As discussed above, Alcoa would use BMPs and the installation of sediment control structures and ponds to limit erosion and reduce sediment transport as a result of storm water runoff from proposed project facilities and disturbance areas. These facilities and practices would control or minimize sediment and turbidity increases in surface water. During and after mining, Alcoa would implement a variety of mitigation measures as described in the proposed Mitigation Plan (Appendix E to the EIS) to recreate wetlands, riparian woodlands, and surface water features of similar nature and function to those existing in the area prior to mining. These mitigation measures include both replacement of features removed on the area disturbed by mining plus creation or enhancement of additional features in a protected area along Mine Creek and Middle Yegua Creek termed the Middle Yegua Mitigation Site.

2.4 Contaminant Determinations

The material proposed for fill into waters of the U.S. would not introduce, relocate, or increase contaminants in the material itself or in the aquatic environment at the proposed disposal site.

2.5 Aquatic Ecosystem and Organism Determinations

2.5.1 Effects on Plankton

Phytoplankton and zooplankton communities may exist in pools and ponds located within and downstream of the project study area. However, stream environments typically contain low species diversity and abundance. Once mine discharges enter these streams, plankton communities would be limited due to the predominance of riffle and run habitats. As discussed in Section 3.5.2.1 of the EIS, flow changes would occur due to water level changes and water discharges. If perennial pool habitat is changed to riffle and run habitat due to increased flows, planktonic species composition and abundance could be changed. However,

planktonic biota are considered to be limited in an aquatic system dominated by intermittent and ephemeral reaches. Erosion control measures would be used to minimize sedimentation effects on water quality. Overall, project disturbance and mine discharge would result in minor or no effects on stream plankton communities.

2.5.2 Effects on Benthos

Short-term, localized increases in sediment could result in temporary effects on benthos (i.e., macroinvertebrates) located immediately downstream of disturbance areas. However, potential changes would be limited to several miles or less in relation to the disturbance areas. By implementing proper drainage design including detention ponds and erosion control measures, the impact of increased sediment levels on macroinvertebrates would be minor. Project disturbance and mine discharge would not affect macroinvertebrates in lower Big Sandy Creek, Middle Yegua Creek, or the Colorado River.

The effects of flow changes on benthos are discussed in Section 3.5.2.1 of the EIS. In general, flow increases resulting from water discharges would create additional habitat and increased abundance for benthic organisms. In contrast, flow reductions from water level changes and watershed modifications during post-mining phase would decrease habitat and lower abundances for benthic biota. Changes in species composition also could occur due to flow changes.

2.5.3 Effects on Nekton

Short-term, localized increases in sediment could reduce the visibility for fish in segments located immediately downstream of disturbance areas. However, effects are considered minor due to the short-term duration of sedimentation, ability of fish to move to less turbid areas to feed, and the use of erosion control measures as part of mine operation. The effects of flow changes on fish communities is discussed in Section 3.5.2.1 of the EIS. Flow increases would result in additional habitat for fish and also allow wider dispersal compared to existing conditions. Project actions resulting in reduced flows would decrease the amount of habitat for fish. These habitat changes could affect fish communities by altering species composition and abundance. Additionally, erosion control measures would further alter sediment loading, which may affect fish populations.

2.5.4 Effects on Aquatic Food Web

Since the potential impacts of project disturbance and discharge on plankton, invertebrate, and fish communities are considered minor, there would be minimal or no effects on the aquatic food web. Potential short-term effects on macroinvertebrates would not affect their role as a food source for fish.

2.5.5 Effects on Special Aquatic Sites

2.5.5.1 Sanctuaries and Refuges

The proposed project would have no effect on either sanctuaries or refuges.

2.5.5.2 Wetlands

The proposed project would remove approximately 5.3 acres of non-forested wetlands that are waters of the U.S. during the life of the mine. This information is discussed in detail in the EIS text. All wetland losses would be mitigated in accordance with Alcoa's Mitigation Plan (Appendix E of the EIS). A total of approximately 5.3 acres of wetlands would be impacted during the life of the mine. Wetlands would be replaced at a ratio of 2:1 during the reclamation process and would be designed to mimic pre-disturbance hydrogeomorphic characteristics. Also, additional wetland areas would be created or enhanced in the Middle Yegua Mitigation Site.

2.5.5.3 Mudflats

The proposed project would have no effect on mudflats.

2.5.5.4 Vegetated Shallows

The proposed project would have no effect on vegetated shallows.

2.5.5.5 Coral Reefs

The proposed project would have no effect on coral reefs.

2.5.5.6 Riffle and Pool Complexes

No riffle and pool complexes would be affected.

2.5.6 Threatened and Endangered Species

Potential effects of the project have been analyzed relative to state and federally listed threatened and endangered species with potential for occurrence in the vicinity of the proposed project (see Section 3.5.1.5 of the EIS). Most of the species addressed in the Special Status Species and Species of Special Concern section of the EIS are considered either very unlikely to occur in the project area or to occur only as rare migrants through the area. The three species discussed below have greater potential for occurring in the mine vicinity and, if present on the mine site or in close proximity, would be more likely to be adversely affected. No impacts to any other state or federally listed, federally proposed, or federal candidate species would occur as a result of the proposed project.

Potential impact to the federally endangered Houston toad (*Bufo houstonensis*) could include incremental habitat loss if mine-related discharge to Middle Yegua Creek reaches the flood plain that bisects the Carrizo outcrop. However, based on the lack of appreciable amounts of suitable Houston toad habitat within the alluvial flood plain and the potential for flow alteration at the Carrizo outcrop, potential impacts to the Houston toad, if present, would be anticipated to be low.

The timber/canebrake rattlesnake (*Crotalus horridus*) is state-listed as threatened by the Texas Parks and Wildlife Department (TPWD). This species has been documented in Bastrop and Lee Counties and at the Sandow Mine in Lee and Milam Counties. However, no timber/canebrake rattlesnakes were observed within the permit area, including during the 1999 and 2000 field surveys (Alcoa 2000 [Volume 6], 2001c [Volume 3]). Based on the known distribution and habitat association of this species, the timber/canebrake rattlesnake could potentially occur in suitable habitat within riparian corridors along jurisdictional waters of the U.S. within the mine area.

The Texas horned lizard (*Phrynosoma cornutum*) also is state-listed as threatened and has the potential to occur in the mine area although none have been observed within the permit boundary or on adjacent areas.

2.5.7 Other Wildlife

The temporary removal of wetlands and riparian areas during the life of the mine would result in a temporary reduction of habitat and foraging locations for wildlife historically utilizing those areas. These impacts are discussed in Section 3.5.2 of the EIS.

2.5.8 Actions to Minimize Impacts

Alcoa's use of BMPs and installation of sediment control structures and ponds would limit erosion and reduce sediment transport associated with storm water runoff from proposed project facilities and disturbance areas. These facilities and practices would control or minimize sediment and turbidity increases in surface water, thereby minimizing impacts to aquatic ecosystems and organisms.

In addition to the environmental control and mitigation measures required by various regulations applicable to the proposed mining activities, Alcoa has proposed a Mitigation Plan (Appendix E of the EIS) that addresses reclamation of wetlands, riparian woodlands, and surface water features. The reclamation objective is to create features of similar nature and function to those existing prior to the mining activities. The mitigation measures outlined in the plan include both replacement of features removed on the area disturbed by mining plus creation or enhancement of additional features in a protected area along Mine Creek and Middle Yegua Creek termed the Middle Yegua Mitigation Site.

To mitigate for the proposed adverse impacts to waters of the U.S. associated with the Three Oaks Mine, the applicant has proposed to perform a combination of activities including mine reclamation, channel relocation, riparian habitat enhancement, and wetland creation within the reclaimed areas and in a protected mitigation site outside the disturbance area. Impacts to aquatic resources would be mitigated in accordance with the following ratios: 1:1 for low quality ephemeral and intermittent streams, 1.5:1 for on-channel ponds and medium quality ephemeral/intermittent stream channels, and 2:1 for emergent wetlands and high quality ephemeral/intermittent channels. No perennial streams would be disturbed. Restored, enhanced, and created areas would be revegetated with native plants dominant within the project area.

Alcoa has identified riparian and wetland reference sites for use as a comparison to evaluate the success of wetland restoration. These reference sites are described and illustrated in Attachment 1.

Alcoa also has prepared mitigation plans related to protection of threatened or endangered species potentially occurring in the mine vicinity. These plans are included in Appendix B to the EIS, Attachment B. Two species of concern listed by the TPWD as state-threatened have potential to occur in the project area. The timber/canebrake rattlesnake (*Crotalus horridus*) has been documented in Bastrop and Lee Counties and at the Sandow Mine in Lee and Milam Counties. However, no timber/canebrake rattlesnakes were observed within the Three Oaks Mine permit area during 1999 and 2000 field surveys (Alcoa 2000 [Volume 6], 2001c [Volume 3]). The Texas horned lizard (*Phrynosoma cornutum*) also is of potential occurrence although none have been observed within the permit boundary or on adjacent areas. Alcoa has prepared a mitigation plan specific for the timber/canebrake rattlesnake including employee education procedures, field surveys, agency reporting, relocation of individuals from areas to be disturbed, and scheduled clearing operations in suitable habitat to minimize potential for impacts. A similar program would be devised for the Texas horned lizard, if it is encountered in the mine area.

2.6 Proposed Disposal Site Determinations.

2.6.1 Mixing Zone Determination

Impacts would occur to those wetlands, ephemeral streams, and intermittent streams eliminated during the mining process. These would be offset by restoration of the habitat types during the reclamation process. Potential impacts to perennial stream reaches downstream from the mine should be minor or nonexistent due to the implementation of BMPs during the mining process.

2.6.2 Determination of Compliance with Applicable Water Quality Standards

The project would not exceed current applicable water quality standards for the State of Texas.

2.6.3 Potential Effects on Human Use Characteristics

2.6.3.1 Municipal and Private Water Supply

The proposed discharge of dredged and fill material into waters of the U.S. would not affect municipal and private water supplies. Pumping of dewatering and depressurization wells would result in a reduction in water quantity for private and municipal wells that are screened within the 20-foot drawdown area of the Simsboro aquifer or within the 20-foot drawdown area in the lower third of the Calvert Bluff Formation. However, if mine-related impacts to private or municipal wells are identified, Alcoa would mitigate the impact as required by the RRC. As discussed in the Groundwater Quality Impacts subsection in Section 2.3.2.3 of the EIS, no impacts to groundwater quality are anticipated.

2.6.3.2 Recreational and Commercial Fisheries

The proposed project would have minimal impact on recreational or commercial fisheries (see Sections 3.9.2 and 3.5.2, respectively, of the EIS).

2.6.3.3 Water Related Recreation

The proposed project would have no effect on water-related recreation in the project area (see Section 3.9.2 of the EIS).

2.6.3.4 Aesthetics

Aesthetics would be impacted by the proposed project (see Section 2.3.2.5) as construction activities and mining operations alter the current visual character of the mine area. Visual impacts would be mitigated to the extent practicable with concurrent reclamation of previously mined pits and by use of natural or planted vegetation screening at public access points and along roadways. The impacts would be localized to the current mine pit and nearby unreclaimed areas of mine spoil. Adverse impacts on aesthetics would be reduced as the completed mine pits are reclaimed and following mining as the remainder of the area is reclaimed.

2.6.3.5 Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

The proposed project would have no effect on national and historical monuments, national seashores, wilderness areas, research sites or similar preserves.

2.7 Determination of Cumulative Effects on the Aquatic Ecosystem

Short-term, localized increases in sediment could result in temporary impacts on benthic macroinvertebrates and periphyton communities in intermittent/ephemeral streams due to cumulative dredge and fill activities. By implementing erosion control measures at the disturbance areas, no overall impact on sediment levels and aquatic biota are expected in perennial stream reaches located downstream of the permit area (i.e., lower Big Sandy Creek, Middle Yegua Creek, and the Colorado River.

2.8 Determination of Secondary Effects on the Aquatic Ecosystem

None.

3.0 PRELIMINARY DETERMINATION OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

The following paragraphs summarize the comparison of anticipated impacts from the proposed Three Oaks Mine project, as mitigated by Alcoa's proposed Mitigation Plan (Appendix E of the EIS), with the specific regulatory criteria on restriction of discharge as listed in 40 CFR 230.10 and excerpted below.

No adaptations to the Section 404(b)(1) guidelines were made relative to this evaluation.

A. "Except as provided under Section 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on

the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences."

The purpose of the proposed project is to provide a long-term, economically stable fuel supply for the existing Rockdale power generating station sufficient to ensure continued operation of Alcoa's Rockdale aluminum smelter. A wide range of alternatives was examined and compared to the Proposed Action. The alternatives considered included No Action, alternative lignite sources, alternative energy sources for the existing smelter and power plant, and alternative plans for constructing, operating and reclaiming the Three Oaks Mine itself. The alternative lignite sources were not practicable due to increased operating costs, the inability to employ existing technologies, and logistics. The alternative energy sources were not practicable due to uncertainties in cost and supply availability over time. The various construction, operation, and reclamation alternatives were not practicable due to cost and logistics. The No Action Alternative is not practicable since it would not satisfy the purpose of the proposed project.

There are no practicable alternatives that would have less adverse impacts on the aquatic ecosystem without other significant adverse environmental consequences that do not involve discharges into "waters of the United States." The proposed project is not within a special aquatic site and is not water-dependent. However, the applicant has demonstrated that there are no practicable alternative sites elsewhere.

B. "No discharge of dredged or fill material shall be permitted if it:

(1) Causes or contributes, after consideration of disposal site dilution and dispersion, to violations of any applicable State water quality standard";

The proposed disposal of fill material at the Three Oaks Mine would not violate any applicable state water quality standards. The proposed project would not violate the toxic effluent standards under Section 307 of the CWA.

(2) "Violates any applicable toxic effluent standard or prohibition under section 307 of the Act";

The proposed disposal of fill material at the Three Oaks Mine would not involve any toxic effluents and would not violate Section 307 of the CWA.

(3) "Jeopardizes the continued existence of species listed as endangered or threatened under the Endangered Species Act of 1973, as amended, or results in likelihood of destruction or adverse modification of a habitat which is determined by the Secretary of Interior or Commerce, as appropriate, to be a critical habitat under the Endangered Species Act of 1973, as amended."

The proposed project would not jeopardize endangered or threatened species or their critical habitat.

(4) "Violates any requirement imposed by the Secretary of Commerce to protect any marine sanctuary designated under Title III of the Marine Protection, Research, and Sanctuaries Act of 1972."

The proposed disposal of fill material at the Three Oaks Mine would not violate any requirements imposed to protect designated marine sanctuaries.

C. "Except as provided under Section 404(b)(2), no discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States."

With the inclusion of mitigation measures identified by Alcoa as part of the proposed action, as described in Section 2.5.4 of the EIS and in Appendix E to the EIS, the Proposed Action would not cause or contribute to significant degradation of the waters of the U.S. The proposed project would not discharge pollutants resulting in significant adverse effects on: 1) human health or welfare; 2) life stages of aquatic life and other wildlife dependent on aquatic ecosystems; 3) aquatic ecosystem diversity, productivity, and stability; or 4) recreational, aesthetic, and economic values.

D "Except as provided under Section 404(b)(2), no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem."

Steps to minimize potential adverse impacts of the project on aquatic ecosystems include BMPs to limit erosion and siltation and the mitigation of unavoidable impacts as discussed in Alcoa's proposed Mitigation Plan (Appendix E of the EIS). The proposed mitigation actions include reclamation of the Three Oaks Mine site, channel relocations and restorations, riparian habitat enhancements, and the creation of new wetlands.

Conclusion

The discharge complies with the USACE guidelines, with the inclusion of Alcoa's proposed mitigation measures and the appropriate and practicable conditions listed below to minimize pollution or adverse effects to the affected ecosystem.

3.1 All Wetland Losses Would be Mitigated

A total of approximately 5.3 acres of wetlands, 38.5 acres of on-channel ponds, and 23.6 acres of ephemeral or intermittent stream channel qualifying as waters of the U.S. would be impacted during the life of the mine. Impacts to these areas would be mitigated in accordance with Alcoa's Mitigation Plan for the proposed Three Oaks Mine (Appendix E of the EIS). This mitigation involves replacement approaches and ratios developed in coordination with the USACE and TNRCC. Mitigation would include both onsite replacement of wetlands, stream channels, and surface waters and enhancement or creation of new resource features on a protected site outside the proposed disturbance area.

3.2 Best Management Practices

BMPs would be implemented to limit erosion and reduce sediment transport as a result of storm water runoff from proposed project facilities and disturbance areas.

ATTACHMENT 1

CHARACTERIZATION OF WETLAND AND RIPARIAN REFERENCE AREAS THREE OAKS MINE

As a guide for reclamation of wetlands and riparian zones in the Three Oaks Mine, two existing wetland and riparian reference areas were documented to provide baseline information on vegetative cover, species composition, and other physical and biological characteristics (Horizon 2002). Those Areas are described below and illustrated in **Photos 1** through **6**.

Riparian Reference Site

This site is located south of FM 696 and west of Lee County Road 304 on an ephemeral tributary of Willow Creek (**Figure A-1**). The tributary exhibits a braided channel condition in this reach with numerous, poorly defined distributary channels across a broad bottom area. The width of the bottom area varies from 20 to 30 feet and the average width of the jurisdictional channel or channels is about 4 feet. Representative photographs are attached. The soils are sandy to silty sand alluvium. The ephemeral nature of this tributary was evident as no water was present, even though significant rains had recently occurred. Soils were damp in many places however.

The riparian zone (bottom) and adjacent uplands were heavily wooded. A dense shrub and sapling layer also was present in most places. Little herbaceous groundcover was present. A quantitative transect was run through the riparian zone to document dominant tree species composition and coverage. From visual assessment, dominant tree species include water oak (*Quercus nigra*), cedar elm (*Ulmus crassifolia*), eastern redcedar (*Juniperus virginiana*), and post oak (*Quercus stellata*). Dominant shrub and saplings included yaupon (*Ilex vomitoria*), eastern redcedar, deciduous holly (*Ilex deciduoua*), and occasional rough leaf dogwood (*Cornus drummondii*). The very sparse groundcover included small-flowered creek oats (*Chasmanthium sessiliflorum*), green briar (*Smilax bona-nox*), rattan vine (*Berchemia scandens*), and poison ivy (*Toxicodendron radicans*). The mature overstory canopy averaged 75 to 85 percent coverage. Average tree height was 45 to 55 feet and the range of diameters included 4 to 18 inches diameter at breast height (dbh). The quantitative sampling provided the following results of stems per acre for trees greater than 4 inches dbh.

Species	Diameter Range	Number per Acre
Water Oak	4” – 8” dbh	--
	9” – 12” dbh	54.4
	13” – 15” dbh	--
	16” – 20” dbh	108.9
E. Redcedar	4” – 8” dbh	108.9
	9” – 12” dbh	--
	13” – 15” dbh	--
	16” – 20” dbh	--
Dead Snags	4” – 12”	108.9
Total Living Trees		381.1

Wetland Reference Site

When observed on January 3, 2002, this area showed a reduced water level from historical trends, possibly due to the improved culvert under CR 304 and possible removal of the beaver debris. Recent beaver activity (chewed trees) was still evident, but no beaver dam was present. Representative photos are attached. The ponded area is generally open water with little or no vegetation. The edges of the pond are lined in many areas with black willow (*Salix nigra*), green ash (*Fraxinus pennsylvanica*), and buttonbush (*Cephalanthus occidentalis*). Small motts or individuals of green ash and buttonbush also are present within the pond. Where previously flooded areas have been exposed due to lowered water levels, herbaceous plants have sprung up that include sedge (*Carex* sp.), bermudagrass (*Cynodon dactylon*), seedbox (*Ludwigia* sp.), and green briar near the edges. Rattle bush (*Sesbania drummondii*) is scattered throughout.

Soils are silty clay loams to clay. The upper 6 inches of soil tends to be silty clay with a matrix of 10YR 5/1 with numerous and distinct 10YR 4/6 mottles. The lower 6 inches of soil is clay with a matrix of 10YR 6/1 with many distinct 10YR 4/6 to 5YR 4/6 mottles and black streaks.

Photo 1. Riparian Reference Site

Photo 2. Riparian Reference Site

Photo 3. Riparian Reference Site

Photo 4. Wetlands Reference Site

Photo 5. Wetlands Reference Site

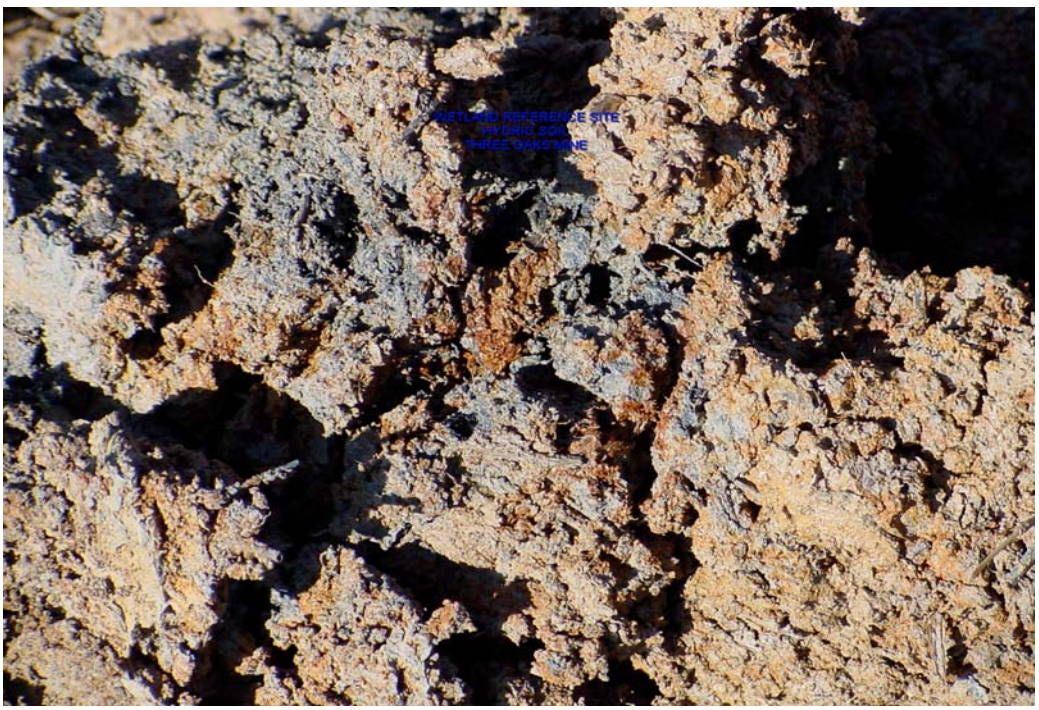
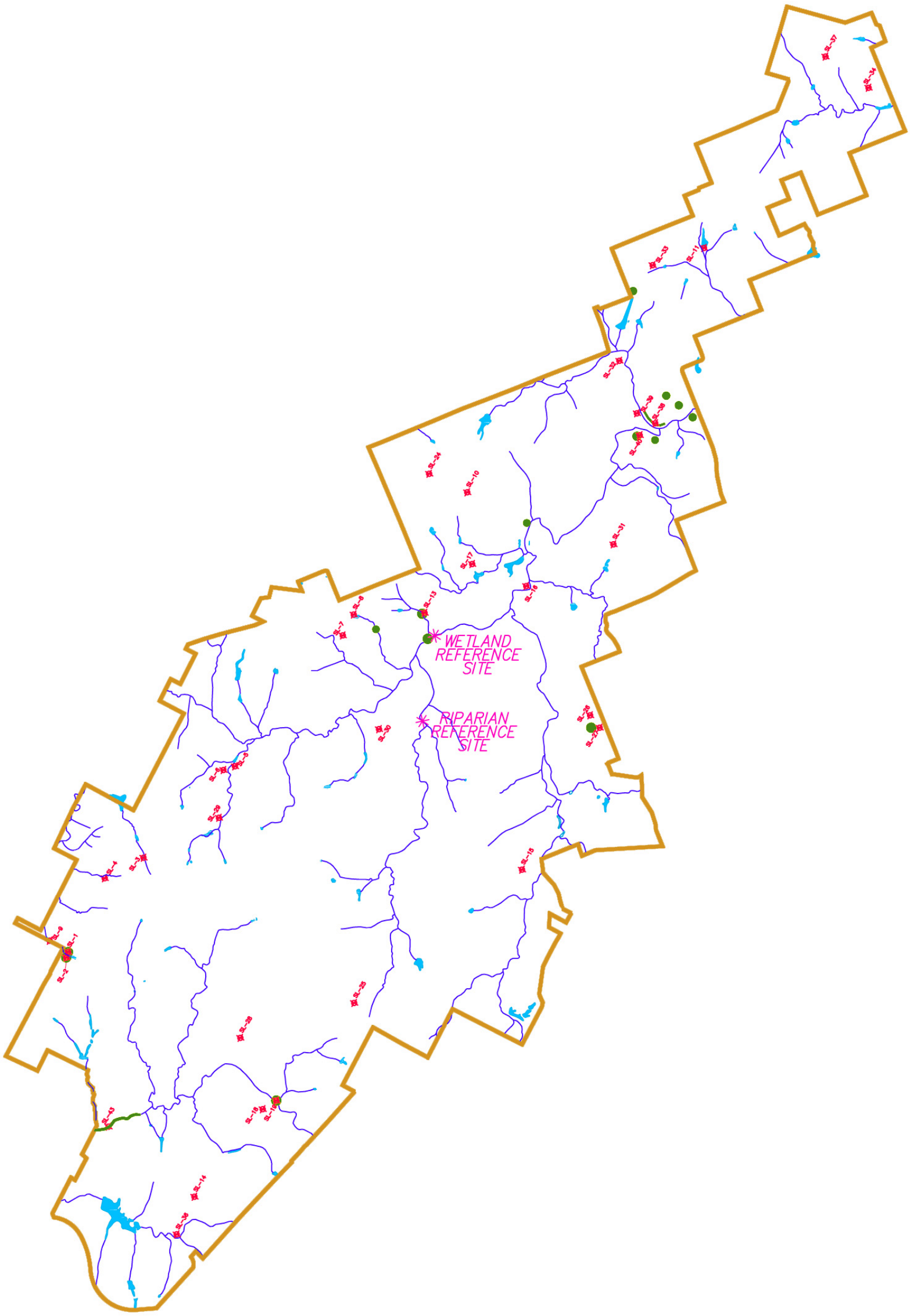


Photo 6. Wetlands Reference Site



Three Oaks Mine

Wetland and Riparian Reference Sites

Figure A-1

Legend

- Three Oaks Permit Boundary (January 2000)
- Creek or Tributary
- Stock Ponds
- Wetlands
- SL–11 Data Sample Locations
- Wetland or Riparian Reference Site

Source: Hodges 2002a.

N

0 1 2 Miles

7/23/02